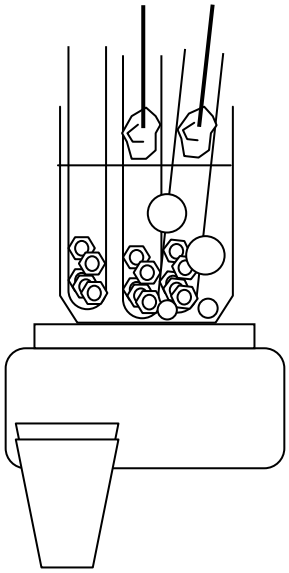
HONOR CHEM Final exam review packet

The first question below will be on the exam ver batim. Of the remaining 24 questions, 10 similar questions will be on the paper part of the exam. Know that there will be at least three different versions of the exam. To try to make all versions have the same level of difficulty, I will try to use an equal number of easy and hard questions on each. Questions 4, 6, 9 & 10 are on material we are covering in these last four weeks of classes. The last page contains all the equations, charts and tables you will be needing. This chart will be given to you for the final as well.

1.[10] Lab: When it's your turn, go over to an open lab station and use the equipment there to determine the specific heat capacity of the hex nuts that are in one of the test tube in the boiling water. NOTE: BE VERY CAREFUL NOT TO BREAK THE TEST TUBES. Use only <u>one</u> of the three samples there – one that has a cotton plug on top. There is cool water to use in the water jug at the central table. Record all you data neatly in the table below. As you finish, place the cotton plug from the test tube you just used into the test tube in the boiling water that does not have a plug in it, empty the water out of your cup, then dry off your sample with a paper towel, place it CAREFULLY back in the test tube and put the test tube CAREFULLY back in the boiling water, but leave it open to dry further with no plug on top. This should leave your station just the way you found it. Call the teacher over to check that you have followed these instructions and to deduct a point if you did not! Then go back to your desk to do your calculations neatly in the space at right. Your grade will be based on how clearly you show your work and on how close your experimental results are to the actual value. As always, watch sig figs and units!



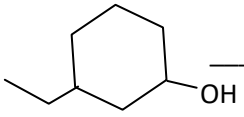
Data Table:

Calculations:

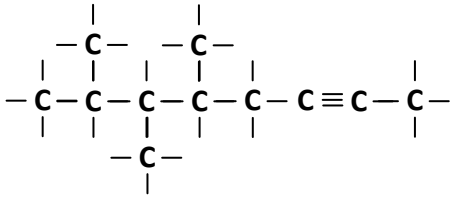
Specific heat capacity: _____

2. Write the correct name for the following three organic compounds:

$CH_3CH_2CHCFCH_2CHFCH_3$ _____



_____



_____

4.6-difluoro-3-heptene
3-ethylcyclohexanol
5,6,7-trimethyl-2-octyne

3. Draw three different isomers for each of the following: (Use line formulas or structural formulas, your choice)

$C_4H_{10}O$

C_4H_7Br

4. At a certain temperature methane molecules move with an average speed of 568 m/s. a) At that same temperature how fast on average would carbon dioxide molecules be moving? b) If it takes the methane 15.6 s to diffuse across the room, how long would it take the carbon dioxide?

a: _____ (343 m/s)

b: _____ (25.9 s)

5. a) Mn-52 undergoes electron capture. What specific isotope does it decay into? _____ (Cr-52)

b) Why does Mn-52 undergo electron capture? _____

c) Mn-52 has a half-life of 5.20 d. Of a 68.0 mCi sample of Mn-52, how much will remain after 10.4 d? _____(17.0 mCi)

d) Mn-51 has an even shorter half-life. Why? _____

e) It takes 16.3 min for 21.7% of a sample of Mn-51 to decay. What is Mn-51's half-life? _____ (46.2 min)

6. a) What is the pH of some 0.0280 M KOH solution? b) What volume of 0.0100 M KOH must be added to 56.0 mL of the 0.0280 M KOH solution to lower its concentration to 0.0210 M?

a: _____ (12.447)

b: _____ (35.6 mL)

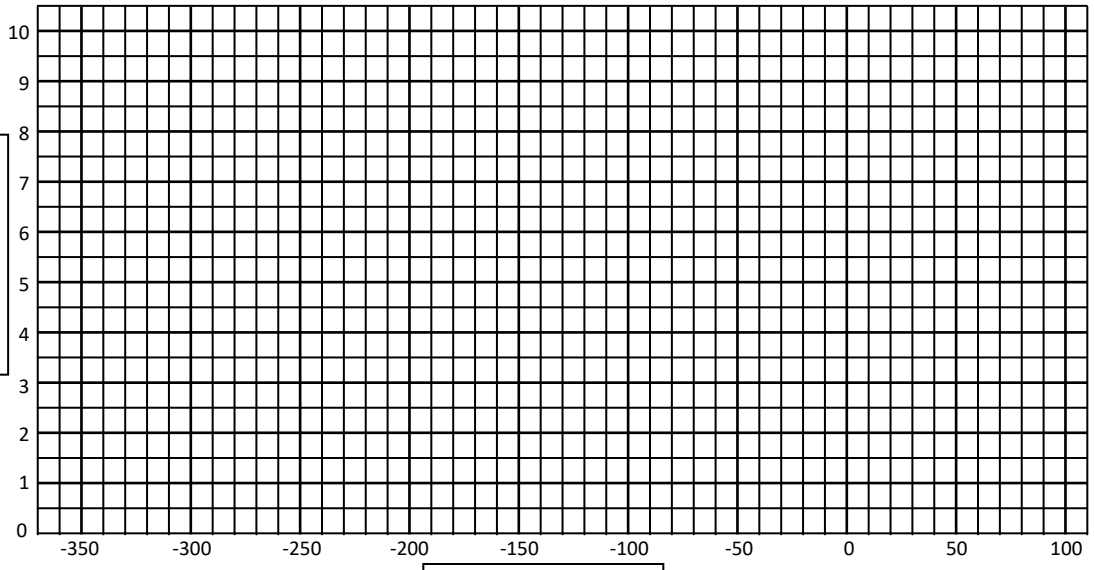
7. What mass of 2,2-difluoropropane gas could fit in a 219 mL canister at 245*C and 855 torr? _____ (0.463g)

8. Write a <u>balanced</u> equation for the reaction of iron(III) chloride and oxygen: _____

($4\ FeCl_3 + 3\ O_2 \rightarrow 2\ Fe_2O_3 + 6\ Cl_2$)

9. The data below are not very good, but plot them anyway and then use them to derive an experimental value (in°C) for absolute zero. Also, label the axes, & write a title for the graph

Temp (°C)	volume of gas sample (mL)
-5.0	7.5
10.0	8.5
45.0	8.8
70.0	9.3
90.0	10.0



Ans: _____ (-360*C)

10. 8.42 moles of Ar and 5.87 moles of CO_2 are placed in a 50.0 L tank. The partial pressure of the argon gas is 345 kPa. a) What is the total pressure of the mixture? b) What temp (*C) is the mixture at?

a: _____ (582 kPa)

b: _____ (-28*C)

11. A beaker weighs 245.67 g. Some $Al_2(SO_4)_3 \cdot X\ H_2O$ is added and the combined mass is 398.31 g. It is placed in an oven for 20 minutes, then removed and cooled. It now weighs 353.07 g. What is a) the formula and b) the name of the hydrate?

a) _____ ($Al_2(SO_4)_3 \cdot 8\ H_2O$)

b)_____

(alumi num sulfate octahydrate)

12. How many moles of butane will react with 7.58 g of oxygen gas? **$2\ C_4H_{10} + 13\ O_2 \rightarrow 8\ CO_2 + 10\ H_2O$** _____

(0.0364 moles)

13. a) What energy is possessed by a photon of infrared light with a frequency of 7.25×10^{13} Hz? b) What is that photon's wavelength in nm? c) What is its velocity in m/s?

a: _____ (4.80e-20 J)

b: _____ (4140 nm)

c: _____ (3.00e8 m/s)

14. Predict whether the following reactions will occur or not. If they do occur, write a balanced net ionic equation beneath the problem. If they do not occur, write "NR." The first has been done for you.

a) $MgBr_2 + Pb(NO_3)_2 \rightarrow$

$Pb^{2+}_{(aq)} + 2Br^{1-}_{(aq)} \rightarrow PbBr_{2(s)}$

b) $K_2S + Fe_2(SO_4)_3 \rightarrow$ ($2\ Fe^{3+}(aq) + 3\ S^{2-}(aq) \rightarrow Fe_2S_3(s)$)

c) $HBr + CaF_2 \rightarrow$ ($H^{1+}(aq) + F^{1-}(aq) \rightarrow HF(aq)$)

d) $NaOH + KNO_3 \rightarrow$ (NR)

15. Draw Lewis structures for each of the following. (Use scrap paper if you wish; then transfer the answer to the box.)

a) SF_4 b) BeI_2 c) CO_3^{2-}

16. In the box at right draw four water molecules. Then use dotted lines to represent the H-bonds that occur? Label all atoms, indicate partial charges.
Use an X to indicate what type of bond/IMF gets broken when water boils.
Use a Y to indicate what type of bond/IMF gets broken when water is decomposed.

17. For each of the following pairs, circle the substance you think would have the higher melting point. Then explain why. The first two are done for you.

x) $CH_2(OH)_2$ (CaO) H_2O **Ionic bonding is stronger than H-bonding**

a) H_2 H_2O (H_2O)

b) $MgBr_2$ Mg ($MgBr_2$)

c) BrF CF_4 (BrF)

d) F_2 Xe (Xe)

18. a) Draw and name the shape of an AX_3 molecule including bond angles and hybridization

b) Draw and name the shape of an AX_4E molecule including bond angles and hybridization

a

(trig pl, 120*, sp^2)

b

(see saw, <90*, <120*, sp^3d)

19. A compound is 16.67% N, 19.05% S, 57.14% O and 7.14% H by mass. What is its empirical formula? _____

BONUS: [3] What is its name: _____ (ammonium sulfate dihydrate) ($N_2SO_6H_{12}$)

20. Write the long electron configuration for S (#16) _____

How many unpaired electrons would an atom of S have? ___ (2)

Write the short-cut electron configuration for Sg (#106) _____

How many electrons would an Sg atom have in the 5th level?___ (32)

How many completely filled <u>sublevels</u> would an atom of Sg have?____ (17)

21.[6] List two elements that would have similar properties to Ba (#56) ____ ____ (Ca, Sr)

List two elements that have a tendency to gain one electron: ____ ____ (F, Cl)

List two elements that have the capacity to lose a variable number of electrons: ____ ____ (Cu, Fe)

22. An empty graduated cylinder weighs 86.72 g. Some 2-propanol (D = 0.786 g/mL) is added and the mass of the cylinder and 2-propanol is 132.13 g. A brass rod is added and the liquid level goes up to 93.8 mL. (Brass's density is 8.52 g/mL). a) What is the new total mass of everything: cylinder, 2-propanol and rod? b) What was the liquid level before the rod was dropped in?

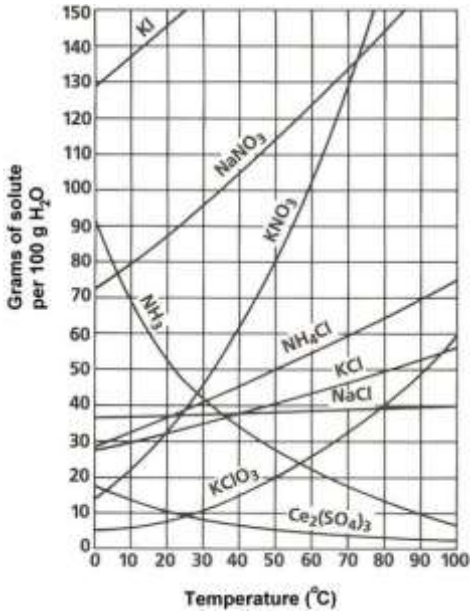
a: _____ b: _____

(439 g) (57.8 mL)

23. a) What temperature would be required to get 17.5 g of potassium nitrate to dissolve in 15.0 g of water? b) What is the percent $NaNO_3$ in a solution that is saturated at 30*C?

a: _____(65*C)

b: _____(49.0%)



24.[6] Silver (Ag) has two isotopes: ^{109}Ag has a precise mass of 108.9048 and accounts for 48.1611% of the element. Ag's atomic mass in the periodic table is listed as 107.868. What is a) the percent, b) the precise mass (to seven sig figs) and c) the symbol of the other isotope?

a: _____ b: _____ c: _____

(51.8389%) (106.9086) (^{107}Ag)

25. What mass of ethanol can be heated from -10.0*C to 90.0*C with 16.7 kJ of heat? _____ (15.5g)

Honors Chemistry Final Exam – Equations and Tables you may find useful…

$\log \frac{N_0}{N_t} = \frac{0.301\ t}{t\ ½}$ $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ $PV = nRT$ $R = 62.4 \frac{L\ torr}{mol\ K}$ or $0.0821 \frac{L\ atm}{mol\ K}$ or $8.314 \frac{L\ kPa}{mol\ K}$

$M = \frac{moles\ solute}{liters\ solution}$ $M_{tot} = \frac{M_1V_1 + M_2V_2 + \ldots}{V_1 + V_2 + \ldots}$ $P_T = P_A + P_B + \ldots$ $P_A = P_T X_A$ $Q = mc\Delta T$ $D = m/V$

$pH = -\log [H^+]$ $pOH = -\log [OH^-]$ $[H^+][OH^-] = 1.0e\text{-}14$ $pH + pOH = 14.00$ $K = {}^oC + 273$

$E = h\nu$ **$c = \lambda\nu$** $h = 6.626 \times 10^{-34}$ Js $c = 3.00 \times 10^8$ m/s

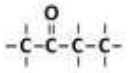
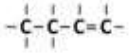
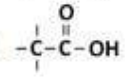
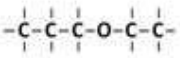
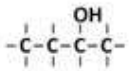
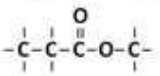
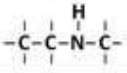
	Soluble		Insoluble
1)	**$Group\ I^{1+}, NH_4^{1+}, NO_3^{1-}, C_2H_3O_2^{1-}$**	→	**(no exceptions)**
2)	**Cl^{1-}, Br^{1-}, I^{1-}**	→ except	**$Pb^{2+}, Ag^{1+}, Hg_2^{2+}$**
3)	**SO_4^{2-}**	→ except	**$Pb^{2+}, Hg_2^{2+}\ Ca^{2+}, Sr^{2+}, Ba^{2+}$**
4)	**$Group\ I^{1+}, NH_4^{1+}$**	← except	**$O^{2-}, S^{2-}, OH^{1-}, CO_3^{2-}, CrO_4^{2-}, PO_4^{3-}$**

Six strong acids: HCl, HBr, HI, HNO_3, $HClO_4$, H_2SO_4

Three substances which decompose spontaneously: H_2CO_3, H_2SO_3, NH_4OH

Particle:	Symbol:
alpha	^4_2He or α
beta	$^0_{-1}e$ or β
gamma	$^0_0\gamma$
positron	$^0_{+1}e$
neutron	^1_0n
proton	^1_1H
deuteron	^2_1H

Organic Functional Groups:

Alkane		Ketone	
Alkene		Carboxylic Acid	
Alkyne		Ether	
Alcohol		Ester	
Aldehyde		Amine	

Activity series

F Cl Br I

Li Rb K Ca Na Mg Al Mn Zn Fe H Ni Sn Pb Cu Ag Pt Au

For water (H_2O)

$c_s = 2.09 \frac{J}{g \cdot C}$ $c_l = 4.18 \frac{J}{g \cdot C}$ $c_g = 2.08 \frac{J}{g \cdot C}$

mp = 0.0°C bp = 100.0°C

Hf = 334 J/g Hv = 2257 J/g

For ethanol (C_2H_6O)

$c_s = 1.39 \frac{J}{g \cdot C}$ $c_l = 2.45 \frac{J}{g \cdot C}$ $c_g = 1.70 \frac{J}{g \cdot C}$

mp = -114.3°C bp = 78.4°C

Hf = 109 J/g Hv = 841 J/g